solution of sugar or salt of adequate concentration.

SWD flies were caught throughout the winter of 2010/11, with the highest catches in hedgerows – unmanaged mixed vegetation adjacent to commercial fields. The lowest catches were at building sites. Trap catches dropped considerably after January, and remained low to nil through the spring. Flies caught from January onward were mostly female.

Spotted wing *Drosophila* in the southern interior valleys of British Columbia, 2010-2011

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Spotted wing drosophila, *Drosophila suzukii*, was first detected in the interior of British Columbia in September 2009. Adult populations were monitored with extensive networks of apple cider vinegar-baited traps in 2010 and 2011. In 2010, *D. suzukii* was widespread in the Okanagan and Similkameen valleys, present in the Creston Valley, and damage was reported in cherry, peach, nectarine, apricot and berry crops as well as domestic small fruit. In 2011, lower population levels were recorded in the Okanagan and Similkameen valleys than in 2010, none was found in the Creston valley and there were no reports of economic damage in commercial fruit. New hosts recorded in the southern interior valleys of B. C. to date are Oregon grape, blue elderberry, northern black currant, honey suckle, Mahaleb cherry and ornamental elderberry.

Presentation Abstracts

Entomological Society of British Columbia Annual General Meeting, University of the Fraser Valley, Abbotsford, BC, Oct. 14, 2011

Olfactory responses of *Micromus variegatus* (Neuroptera: Hemerobiidae) to pepper leaves infested with *Myzus persicae* and *Aulacorthum solani* (Homoptera: Aphididae).

Rob McGregor & Chloé Hemsworth *Institute of Urban Ecology, Douglas College*

Micromus variegatus (Neuroptera: Hemerobiidae) is being evaluated for biological control of pest aphids on greenhouse-grown peppers in BC. Responses of adult females to the odours of pepper leaves infested with *Myzus persicae* and *Aulacorthum solani* (Homoptera: Aphididae) were conducted using y-tube olfactometers. *M. variegatus* females show a slight preference for the odour of *M. persicae*-infested leaves vs. clean plant odours. No similar preference was recorded for the odour of *A. solani*-infested leaves vs. clean plant odours. Results are discussed as they relate to the use of *M. variegatus* for biological control of *M. persicae* and *A. solani* in BC pepper greenhouses.

Cryptic diversity of a candidate weed biological control agent

Chandra E. Moffat, Robert G. Lalonde & Jason Pither *Department of Biology, University of British Columbia, Kelowna BC*

We surveyed host plant use of a candidate weed bio-control agent (a gall wasp), for invasive hawkweeds, in its native range of Central Europe. Despite gall occurrence on multiple host species, when suitable species co-occurred we found that host use was significantly non-random, with only the most abundant species being utilized.

Update on Balsam woolly adelgid in BC

Gabriella Zilahi-Balog *Canadian Food Inspection Agency, Kelowna, BC*

The balsam woolly adelgid was accidentally introduced into North America

from Europe in the early 1900s. It is a pest of *Abies* sp. and infested trees have reduced vigor, growth that can eventually result in tree mortality. This pest is regulated both provincially and federally. The history of balsam woolly adelgid in BC, biology, regulations and recent detections outside the current quarantine zone will be discussed.

Cool Caterpillars: Low Temperature Biocontrol of A Climbing Cutworm

T. Scott Johnson[1], Tom Lowery[2], Joan Cossentine[2], and Jenny Cory[1] [1]*Department of Biological Sciences, Simon Fraser University, 8888 University Drive. Burnaby, BC, V5A 1S6 Canada* [2]*AAFC, Pacific Agriculture Research Centre, 4200 Highway 97, Summerland, BC V0H 1Z0 Canada.*

Abagrotis orbis is a climbing cutworm pest in the vineyards of the Okanagan. Much of their active feeding periods occur under cooler temperatures. We evaluated their susceptibility to several entomopathogenic fungi and nematodes across three temperatures. The larvae were susceptible to entomopathogenic fungi and nematodes with the highest mortality rates occurring at higher temperatures, though significant mortality took place at lower temperatures.

Resistance to *Bacillus thuringiensis* alters macronutrient selection, regulation and utilization in the cabbage looper, *Trichoplusia ni*: Effects on performance and disease resistance

Ikkei Shikano and Jenny Cory *Department of Biological Sciences, Simon Fraser University*

Nutritional qualities of host plants affect both insect performance and condition. Previous studies have shown that Bt-resistant *Trichoplusia ni* exhibit significant developmental costs when reared on certain host plants. We examined whether susceptible and Bt-resistant *T.ni* select, regulate and use macronutrients differently, and how such differences may influence performance and susceptibility to Bt challenge.

The influence of natal host on the fecundity of the parasitoid, *Praon unicum*, on the blueberry aphid, *Ericaphis fimbriata*

Erfan Vafaie[1], Sheila Fitzpatrick[2], Jenny Cory[1] [1]*Department of Biological Sciences, Simon Fraser University, 8888 University Drive. Burnaby, BC, V5A 1S6 Canada* [2]*AAFC, Pacific Agriculture Research Centre, 4200 Highway 97, Summerland, BC V0H 1Z0 Canada.*

We studied the effects of rearing *Praon unicum* on an alternative host, *Myzus persicae,* on its ability to parasitize novel aphid hosts. A combination of potential/ realized fecundity, and fitness proxies were used to determine the impact of an alternative host and are discussed in the context of augmentative control.

Identifying feeding attractants from showy milkweed flowers for potential control of the apple clearwing moth

Eby, C[1]; Gardiner, M[2]; Gries, R[1]; Judd, G[2]; Gries, G[1] [1]*Simon Fraser University, Department of Biological Sciences, Burnaby, BC* [2]*Pacific Agri-Food Research Centre, Summerland, BC*

Adult *Synanthedon myopaeformis*, an exotic pest of apples in BC, commonly feed on showy milkweed flowers. Candidate feeding attractants captured using floral headspace analyses were identified using GC-EAD and proboscis extension assays. A single chemical was shown to be highly attractive to both males and females in field trapping assays.

Supporting Butterfly Conservation in British Columbia: The BC Butterfly Atlas

Patrick Lilley *Raincoast Applied Ecology, Vancouver, BC*

Mapping biodiversity information is invaluable for the conservation of species and their habitats. Involving citizens can extend the reach of survey projects while also making nature more accessible and fun. Following on the success of the BC Breeding Bird Atlas and butterfly atlassing projects in other jurisdictions, the BC Butterfly Atlas is a multi-year effort to inventory and assess the status of butterflies in British Columbia. The BC Butterfly Atlas aims to establish a network of observers to observe, record, and report butterfly sightings from across the province. Results will be combined with existing butterfly records to create an online atlas documenting the distribution of butterflies in BC. Like the Breeding Bird Atlas, participation from a broad range of volunteer observers, from amateurs to experts, will be

key to the success of the project. This talk will introduce the elements of the BC Butterfly Atlas project and discuss opportunities for participation and involvement.

Estimating the impact of arthropod predators preying upon lygus nymphs in the Peace River region of Canada.

Letitia Da Ross & Jennifer Otani *Agriculture & Agri-Food Canada, Beaverlodge Research Farm, Beaverlodge, AB*

Lygus bugs are native pests that are often found in abundance, feeding on canola buds and pods. To estimate potential predation pressure on lygus, four general predators were collected from fields in 2010, then isolated with 3rd, 4th and 5th instar lygus nymphs. The prey preference results of these predators will be presented.

Group morphology affects foraging success in social spiders

Maxence Salomon *Biodiversity Research Centre, UBC, Vancouver*

Social spiders that build communal webs may rely on the architectural properties of their webs to achieve foraging success. I conducted a field experiment to examine foraging dynamics in two social species of *Anelosimus* spp. spiders that vary in individual and group morphology, and show that foraging success depends both on the functional morphology of their communal webs and individual cooperative behaviours.

Update on a few insect species at risk initiatives in British Columbia

Jennifer Heron *British Columbia Ministry of the Environment, 315 – 2202 Main Mall, Vancouver, BC, Canada V6T 1Z1*

Insect conservation is one of the greatest challenges to conservation practitioners. Assessing the conservation status of insect species is more challenging than other species groups, primarily because so little information is available on individual species. Assessing the conservation status involves a number of criteria developed by Natureserve (www.natureserve.org) and the BC Conservation Data Centre (www.env.gov.bc.ca/cdc). Some of the information used to assess a species' conservation status includes 1) inventory and search effort (e.g., including search effort with no records); 2) species information; 3) provincial, national and global distribution; 4) associated habitat and habitat trends including historic habitat trends and whether the species is associated with an ecosystem at risk; 5) biology and natural history; 6) population sizes And trends; 7) limiting factors and threats; 8) special significance of the species; 9) existing protection including both legislative protection and other status designations; and 10) collections examined. In some instances, a status report is prepared at the provincial level or at national level and incorporates this above information as well as other details about the species.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is the national committee that assesses whether a species should be recommended for listing under the federal Species At Risk Act (SARA) (www.cosewic.gc.ca). To assist COSEWIC status report writers (e.g., provide more information on three insect species currently having national status reports prepared), targeted surveys for three insect species were completed in 2010/11: Western Bumblebee (*Bombus occidentalis*), Audouin's Night-stalking Tiger Beetle (*Omus audouini*) and Western Branded Skipper (*Hesperia colorado oregonia*).

Once a species has been assessed by COSEWIC and listed under the Species At Risk Act (SARA) as extirpated, endangered, threatened or special concern the responsible jurisdiction (e.g., British Columbia) prepares a recovery strategy or management plan that outlines a plan for recovery. The recovery strategy follows science advice given by a group of individuals under a recovery team. Recovery team members include representatives from local stewardship groups, landowners and lands managers, government staff from all levels, researchers and private citizens interested in conservation of the species.

Individuals interested in the recovery of species at risk are encouraged to contact the recovery team chair and either engage in participating on the recovery team or suggest how they would like to become involved or lead recovery actions for the species. Recovery actions are most often linked with reducing threats to the species (e.g., removal of invasive plants that may be contributing to

a decline in host plant growth for a specific butterfly), habitat restoration or studying the species' life history. Recovery actions also link closely with stewardship and local conservation groups, as well as other recovery teams in order to avoid conflicts with recovery actions for other species.

The challenges surrounding invertebrate conservation and the path forward involve engaging numerous agencies, groups, and incorporating initiatives into existing infrastructure. A present provincial invertebrate conservation plan is being drafted, which outlines a broad approach to protecting this species group throughout the province. Part of the recommendations within this plan involves engaging stakeholders and others interested in invertebrate conservation into being part of recovery teams, writing status reports on species they think are possibly at risk, educating people on insect identification and encouraging people to submit records and sightings to the BC Conservation Data Centre. Those interested are encouraged to contact the presenter about how they can contribute to provincial invertebrate conservation initiatives.

Aphid mummies provide parasitoids with a temporal refuge from predation by ladybird *Harmonia axyridis*

F. Simon[1,2,3] and D. Gillespie[2] [1]*Simon Fraser University* [2]*Agriculture and Agri-Food Canada* [3]*University of the Fraser Valley*

Harmonia axyridis is a predatory ladybird, which consumes aphids and parasitoids. This study demonstrates that parasitoid mummies are a refuge from predation. Additionally, *H. axyridis* has differential preference for *Aphidius matricariae* over *Praon unicum*. Consequences of *H. axyridis*' preference will be discussed in the context of biological control and impacts for native aphid-parasitoid systems.

The effects of experience on intermale competition in the western black widow spider

Tanya L.M. Stemberger[1,2], Maria Modanu[2], Maydiannce C.B. Andrade[2] [1]*Department of Biological Sciences, Simon Fraser University* [2]*Department of Biological Sciences, University of Toronto Scarborough*

Understanding factors affecting multiple mating by males is critical to assessment of the intensity of sexual selection. We asked whether males with mating experience suffer a decrease in the likelihood of future matings in the western black widow spider (*Latrodectus hesperus*). Males of this species largely cease eating after adulthood, and so have a limited energetic budget for mate searching, courtship and competition. Mating includes a six-hour long, energetically expensive courtship, and at copulation a portion of the male's genitalia breaks off in the female's reproductive tract. Although sexual cannibalism is rare and *L. hesperus* males are physically able to copulate with multiple females, we predicted mating would decrease a male's resource holding potential and the likelihood of remating under competition. We paired once-mated males with size-matched virgin rivals and allowed them to compete for a female. Contrary to predictions, once-mated males won copulations as effectively as their virgin rivals, despite the prior loss of energy to intense courtship and genital trauma. Moreover, in all cases, only one male out of every pair copulated with the female. This suggests mating success may be mediated by female preferences rather than inter-male competition, which may explain why experienced males suffer no disadvantage.

Entomological biocontrol agents of illicit drug plants

Adrian L. Behennah *1829 Laval Avenue, Victoria, BC Canada V8N 1M9*

Herbivores of the botanical sources of heroin, cocaine, and marijuana were researched by the UN and the USA during the past 40 years for use as biocontrol agents, including the poppy capsule weevil, *Ceutorhynchus* (*Neoglocianus*) *maculaalba*; cocaine tussock moth, *Eloria noyesi* (Lepidoptera: Noctuidae); and hemp flea beetle, *Psylliodes attenuata* (Coleoptera: Chrysomelidae).

A century of outbreaks: tracking the western spruce budworm in BC

Lorraine Maclauchlan *Ministry of Forests, Lands and Natural Resource Operations, Kamloops, BC*

The story of western spruce budworm (WSB), *Choristoneura occidentalis* Freeman,

in British Columbia reflects the changing climatic and human patterns observed this past century in Douglas-fir, *Pseudotsuga menziesii*, dominated forest environments. WSB has less predictable population fluctuations than other defoliating insects, with outbreaks lasting several years or collapsing after only one to two years. Based upon analysis of stand structure, geographic and topographic features, ecosystems and defoliation history, twelve distinct outbreak regions have been defined. Within these geographic outbreak regions the periodicity of budworm outbreaks is described. BC has records of budworm outbreaks going back to 1909 that help illustrate population fluctuations. The first recorded outbreaks occurred on Vancouver Island in the early 1990s yet no outbreaks have since occurred on the island. Thomson and Benton (2007) attribute the cessation of WSB outbreaks on Vancouver Island as possibly due to warming sea temperatures that promote early larval emergence and thus poor synchrony between insect and host tree. Since the 1930s all WSB outbreaks have occurred in the interior of BC. The Coast Region has experienced very regular, periodic budworm outbreaks since 1940 but the scale of outbreaks has decreased over the past two outbreak cycles. The dry canyon forests near Lillooet have the longest and most regular, chronic, outbreak cycles with five distinct outbreaks in the past century. Each outbreak ranged from a few thousand, to over a hundred thousand hectares of annual defoliation. Although budworm can occur in most Douglas-fir dominated ecosystems, there are still some areas where there appears to be no history of WSB outbreaks.

Budworm is present at low levels in most susceptible forest types. However these insect populations may or may not be able to reach what we define as outbreak proportions unless certain stand conditions are met or some biological or physiological triggers occur. In 2006 Maclauchlan *et al.* reported that there were large areas or susceptible forest type in south and central BC, such as the Cariboo-Chilcotin, where WSB had never reached outbreak levels. The Thompson Okanagan has seen large, often sustained outbreak periods, but these have all occurred within the past three decades. Prior to the 1970s the budworm seldom reached outbreak levels in this region.

Budworm was first mapped in the Cariboo Region in 1974 but only over a small area and no outbreaks were recorded until the late 1990s. Once the budworm population expanded it spread rapidly, mingling with existing endemic populations throughout the Cariboo-Chilcotin. The Cariboo budworm outbreak is one of the largest and most sustained outbreaks ever recorded in BC. The most recent chapter in the budworm saga now has populations expanding north between Williams Lake and Quesnel and into the Kootenay Boundary Region in southern BC. The Quesnel outbreak marks the most northern outbreak yet recorded. Similarly, outbreak populations built in the Princeton and Merritt areas in the past decade where historically there also had been few or no records of outbreak level populations.

The WSB is reacting to our changing climate and increasingly favourable and available host resource. Current budworm outbreaks are distinguished by their expansion into higher elevations and new territory. This change in outbreak dynamics is a response by the insect to milder, more suitable climatic conditions; altered stand conditions; and forests that have little inherent resistance to this insect. As the climate warms, budworm may continue to expand in range toward the limit of its primary host, Douglas-fir.

Maclauchlan, L.E., J.E. Brooks and J.C. Hodge. 2006. Analysis of historic western spruce budworm defoliation in south central British Columbia. Forest Ecology Management 226: 351-356.

Thomson, A.J. and R.A. Benton. 2007. A 90-year sea warming trend explains outbreak patterns of western spruce budworm on Vancouver Island. The Forestry Chronicle 83(6): 867-869.